CHAPTER 10. ECONOMIC ANALYSIS

10.1 Introduction

The Regional Water Boards are legally required to consider economics in Total Maximum Daily Load (TMDL) development and water quality control planning (basin planning), as described in a memorandum from Sheila K. Vassey, Senior Staff Counsel in the Office of Chief Counsel of the State Water Resources Control Board (Vassey 1999). Under state law, there are three triggers for Regional Water Board consideration of economics or costs in basin planning. They are:

- The Regional Water Boards must estimate costs and identify potential financing sources in the basin plan before implementing any agricultural water quality control program.
- The Board must consider economics in establishing water quality objectives that ensure the reasonable protection of beneficial uses.
- The Boards must comply with the California Environmental Quality Control Act (CEQA) when they amend their basin plans. CEQA requires that the Boards analyze the reasonably foreseeable methods of compliance with proposed performance standards and treatment requirements. This analysis must include economic factors.

Chapter 9 is the analysis of potential environmental impacts associated with implementation of the TMDL as required under CEQA. In Chapter 9, staff identifies the reasonably foreseeable compliance measures necessary of land owners/dischargers to achieve compliance with the TMDLs and the proposed revised DO objectives. These compliance measures, or best management practices, are not requirements of individual landowners/dischargers. They are simply those management practices most likely to be necessary to achieve compliance. Land owners/dischargers have the responsibility of identifying the means of achieving compliance best suited to the site specific characteristics of their particular land and operation.

What follows is an estimate of the costs associated with those management practices which are reasonably foreseeable as necessary to achieve compliance with the TMDL and proposed revised DO objectives. The costs are given as a range, dependent on the specific characteristics of the land or operation to which a given management practices is applied. A list of potential funding sources is also given.

The Regional Water Board is not obligated to consider the balance of costs and benefits associated with implementation of a TMDL or basin plan amendment. It is only obligated to consider economic factors and may adopt a TMDL or basin plan amendment even if the costs are significant.

10.2 Scope of the Economic Analysis

10.2.1 Existing Requirements

Landowners and dischargers are bound by various existing regulatory requirements that involve water quality and natural resource protection. The economic impact of existing

obligations should not be attributed to the costs of compliance with the proposed Klamath River TMDL Action Plan and revised DO objectives. But, limiting the scope of the economic analysis is difficult given the similarity of measures necessary to achieve a wide range of water quality and wildlife protection goals. To remain as focused as possible, this economic analysis only contemplates the costs of measures identified as reasonably foreseeable (see Chapter 9) in the implementation of the Klamath River TMDL Action Plan and revised DO objectives. But, if taken as a whole, they are likely an overestimate of the actual costs of compliance. This is because of the multiple and overlapping regulatory programs under which the same measures are reasonably foreseeable.

For example, some temperature, nutrient, or dissolved oxygen control costs are related to actions necessary to avoid a violation of the sediment prohibitions in the Basin Plan and to avoid a taking under the Endangered Species Act or to fully mitigate impacts of authorized takes. Other costs may be incurred as a result of compliance with the Clean Water Act, other related statutes and regulations, or local land use ordinances. Conversely, compliance with the proposed Klamath River TMDL Action Plan will help dischargers comply with the other regulatory requirements.

Applicable existing requirements include:

- Existing Basin Plan requirements (such as the federal and state antidegradation policies, the controllable factors requirement, the general Waste Discharge Requirements and general waiver for timber harvest activities, and the existing water quality objectives for temperature, dissolved oxygen).
- State nonpoint source program requirements.
- Porter-Cologne Act requirements (such as the requirement of Section 13260 for every person who discharges a waste that impacts water quality to file a report of waste discharge with the Regional Water Board, and the cleanup and abatement requirements of Section 13304).
- The California Department of Forestry and Fire Protection requirements for timber harvest activities.
- The federal and state endangered and threatened species requirements.
- Obligations imposed by other local, state and federal natural resource agencies.

10.2.2 Geographic Scope

The implementation actions proposed by the Klamath River TMDL Action Plan for compliance with the TMDLs and revised DO objectives (see Chapter 6) are not uniformly required across the Klamath River watershed or even across properties with similar land uses. Instead, many of the implementation actions will be required of landowners/dischargers on an as-needed, site-specific basis or are simply activities that are encouraged by the Regional Water Board. While this flexibility adds greatly to the effectiveness of the Klamath River TMDL Action Plan, it is one factor preventing this economic analysis from totaling costs on a watershed scale. Another factor preventing the development of watershed scale costs is the lack of a watershed scale inventory of pollution-causing activities/features (e.g., miles of roads requiring decommissioning).

Additionally, more intensive land use activities will face greater costs than less intensive land use activities. Activities on steep, erosive slopes in proximity to waterbodies will require greater care and higher costs than activities on lands that do not deliver to a water body or on lands that are not highly erosive.

10.2.3 Methodology

The costs identified in this chapter primarily come from three sources of information: the Natural Resources Conservation Service (NRCS) ProTracts cost dataset; California Department of Fish and Game (CDFG) Salmonid Stream Habitat Restoration Manual (2006) (Manual) for road-related costs, and estimates provided by PacifiCorps for reservoir-related measures. ProTracts is a national dataset maintained by NRCS to assist local NRCS Districts in setting cost shares for implementing conservation practices. Cost estimates are provided at the county level and the data used for this analysis are specific to Siskiyou County, as described in their California Approved Fiscal Year 2008 Payment Schedule.

The costs included in the CDFG Manual are described as upslope erosion inventory and sediment control guidance. The numbers are based on estimates from Pacific Watershed Associates, a consulting firm specializing in erosion control work. Actual costs can vary considerably depending on operator skill and experience, equipment types, local site conditions, and regional location.

The cost estimates provided by PacifiCorp are those to which PacifiCorp has agreed in the Agreement In Principle (AIP) entered into by PacifiCorp, the State of California, the State of Oregon, and the U.S. government. All other costs potentially associated with PacifiCorp's compliance with the TMDL are considered too speculative at present because of the confidential nature of the on-going negotiations amongst the parties to the AIP.

10.3 Estimated Costs of Compliance

10.3.1 PacifiCorp

PacifiCorp has entered into an agreement in principle (AIP) with the State of Oregon, the State of California, and the federal government to resolve "certain litigation and other controversies in the Klamath Basin, including a path forward for possible Facilities removal" (AIP 2008). The AIP constitutes PacifiCorp's interim funding commitments while the negotiations continue on the topic of dam removal. Table 10.1 presents the costs associated with the AIP measures related to compliance with the TMDL. Costs for the breadth of interim measures discussed in Chapter 6 (Implementation Plan) and Chapter 9 (CEQA Environmental Analysis) are included as a lump sum in item #11. Costs for dam removal have not been included because they are at this point too speculative.

Table 10.1: Costs to PacifiCorp of Interim Compliance Measures

#	Interim Measure Task Title	Funding Commitment
9	California Klamath Restoration Fund/Coho Enhancement Fund	$500,000 annually until dams removed
10	Iron Gate Turbine Venting	$73,310 annually
11	Nutrient Reduction Measures	$5 million plus $500,000 annually
12	Water Quality Monitoring	$500,000 annually
13	Fish Tissue Consumption Risk Analysis	$250,000 one time cost
21	Iron Gate Gravel Placement	$7,131 annually
23	Water Quality Technical Conference	$100,000 one time cost
	One time costs	$5,350,000
	Annual costs	$1,580,441

10.3.2 Irrigated Agriculture

Irrigated agriculture occurs primarily in the upper Klamath Basin, including the Lost, Shasta and Scott River valleys. USBR reports that approximately 225,000 acres of rangeland in the upper Klamath Basin (south-central Oregon and north-central California) have been transformed into productive farmland due to the availability of irrigation water provided by USBR. Principal irrigated crops are barley, irrigated pasture, alfalfa hay and other hay, oats, potatoes, and wheat (http://www.usbr.gov/dataweb/html/klamath.html). Table 10.2 presents the estimated costs to irrigated agriculture in California of reasonably foreseeable compliance measures for the Klamath River TMDL, and are taken from the Natural Resources Conservation Service (NRCS) Siskiyou County District Office Fiscal Year 2008 payment schedule. For most of the management practices, a range of costs is given, depending on numerous site-specific factors to be determined by landowners/dischargers.

Table 10.2: Estimated Costs to Irrigated Agriculture of Reasonably Foreseeable Compliance Measures.

Reasonably Foreseeable Compliance Measure	NRCS Practice Name	NRCS Practice Cost	NRCS Practice Code
Nutrient Management			
Comprehensive Nutrient Management Plan	Nutrient management	$2000-6000/plan	#100
Monitor soil, irrigation water and residual plant matter		To be determined	
Time fertilizer application with plant needs	Timing	No cost	NA
Water Management (see below)	See below	See below	See below
Cover crops	Irrigated or non-irrigated	$61-112/acre	#340
Buffer areas	Non-native or native seedbed preparation; tree/shrub establishment	$75-371/acre	#386, #612
Pest Management			
Precision Pest Control Application	Precision pest control	$30/acre	#718
Pest Management	IPM, reduced risk, or transition to organic certification	$30-125/acre	#595

Table 10.2 (cont.): Estimated Costs to Irrigated Agriculture of Reasonably Foreseeable Compliance Measures.

Reasonably Foreseeable Compliance Measure	NRCS Practice Name	NRCS Practice Cost	NRCS Practice Code
Erosion and Sediment Control			
Maintain crop residue or vegetative cover	Cover crop	$60-112/acre	#340
Improve soil properties	Deep tillage Mulch till Cover crop	$55-105/acre $30/acre $60-112/acre	#324 #345 #340
Reduce slope length, steepness, or unsheltered distance	Precision land forming	$175/acre	#462
Practices to reduce detachment	Chiseling and subsoiling Conservation cover Conservation crop rotation Residue management Cover crop Critical area planting Seasonal residue management Diversion Windbreak/shelterbelt establishment Windbreak/shelterbelt renovation Mulching Irrigation water management Cross wind ridges/stripcropping/trap strips Surface roughening Tree planting Waste utilization Wildlife upland habitat management	$55-106/acre $97-750/acre $50/acre $60-113/acre $249-1,229/acre $30/acre $10/ft $0.08-1.47/ft $0.13-0.57/ft $78-299/acre $5-50/acre Not available Not available $75-283/acre $30-50/acre $10-50/acre	#324 #327 #328 #329 #340 #342 #344 #362 #380 #650 #484 #449 #589 #609 #612 #633 #645
Practices to reduce transport within the field	Contour farming Field windbreak Grassed waterway Contour stripcropping Herbaceous wind barriers Field stripcropping Terrace Contour buffer strips	Not available Not available $250-470/acre Not available $400/acre Not available $5/acre Not available	#330 #392 #412 #585 #442A #586 #600 #332
Practices to trap sediment below the field or critical area	Sediment basins Field border Filter strip Water and sediment control basin	$4701/no. $82-370/acre $117-393/acre $245-4,902/no.	#350 #386 #393 #638
Protect and manage existing wetland and/or riparian areas for their natural filtering functions	Riparian herbaceous cover/forest buffer, wetland restoration	$75-1,200/acre	#390, #391, #657

Table 10.2 (cont.): Estimated Costs to Irrigated Agriculture of Reasonably Foreseeable Compliance Measures.

Reasonably Foreseeable Compliance Measure	NRCS Practice Name	NRCS Practice Cost	NRCS Practice Code
CEQA Mitigation Measures			
Mulch exposed areas	Mulching	$78-299/acre	#484
Protect drainage channels from sediment contributions with vegetated buffers, wattles, or similar erosion control devices	Filter strip	$117-393/acre	#393
Wetland wildlife habitat management	Low, medium or high intensity	$10-50/acre	#644
Installation of grade stabilization structures	Grade stabilization structure	$250-10,000/no.	#410
Streambank and shoreline protection	Low-high complexity	$24-122/ft	#580
Stream channel stabilization	Stream channel stabilization	$25/ft	#584
Use exclusion	Forage exclusion, wetlands	$15/acre	#472
Riparian forest buffer/herbaceous cover	Riparian forest buffer/herbaceous cover	$75-1170/acre	#390, #91
Control of streambank erosion via vegetative or structural practices	Streambank and shoreline protection	$23-122/ft	#580
Irrigation Management			
Irrigation scheduling	Irrigation water management	$5-50/acre	#449
Efficient application of irrigation water	Microirrigation, sprinklers	$250-1250/acre	#441, 442
Efficient transport of irrigation water	Installation of piping to replace open ditches	$2-5/ft	#516
Use of runoff or tailwater	Irrigation system/tailwater recovery	$77-102/acre	#447
Management of drainage water	Runoff management system	$5000/no.	#570
CEQA Mitigation Measures			
Vegetated filter strips	Filter strip	$117-393/acre	#393
Surface field ditch	Field ditch	$3/cy	#607
Water table control, controlled drainage	Subsurface drain	$1-2/ft	#606

Source: California Approved Fiscal Year 2008 Payment Schedule for Siskiyou County District of the Natural Resources Conservation Service.

10.3.3 Grazing

Grazing activities occur throughout the Klamath River basin both on private and public lands. As with the estimated costs to the irrigated agricultural community to comply with the Klamath River TMDL and revised DO objectives, the estimates to the grazing community are derived from NRCS Fiscal Year 2008 Payment Schedule for Siskiyou County. Costs for each of the reasonably foreseeable compliance measures identified in Chapter 9 are provided in Table 10.3

Table 10.3: Costs to Grazing of Reasonably Foreseeable Compliance Measures

Reasonable Foreseeable Compliance Measure	NRCS Practice Name	NRCS Practice Cost	NRCS Practice Code
Grazing Management Practices			
Grazing Management Plan		To be determined	
Pasture and hay planting	Seedbed preparation, see and seeding, non-native	$125/acre	#512
Rangeland planting	Drill or broadcast, native or non-native	$26-644/acre	#550
Forage harvest management	Forage harvest management	Not available	#511
Vegetation control with grazing	Prescribed grazing	$10/acre	#528A
Use exclusion	Forage exclusion	$15/acre	#472
Nutrient management	AFO Manure Management-North Coast	$25/acre	#590
Alternate Water Supply Practices			
Irrigation management	Irrigation water management	$5-50/acre	#449
Installation of pipeline for off-channel water	Pipeline, rough terrain, steel or plastic	$2-5/ft	#516
Constructing off-stream pond	Pond up to 50 AcFt	$4,534-23,625/no.	#378
Installing trough or tank for off-channel water	Watering facility	$245-1,230/no.	#614
Constructing well	Water well	$990-9,905/no.	#642
Improving springs	Spring development	$981-1,981/no.	#574
Riparian Grazing Practices			
Use exclusion	Fence	$0.39-5.25/ft	#382
Animal trails and walkways	Animal trails and walkways	$3/ft	#575
Stream crossing	Ford, culvert, bridge	$1000-50,000	#578
Land and Streambank Stabilization Practices			
Nutrient management	AFO Manure Management-North Coast	$25/acre	#590
Channel vegetation	Channel bank herb., tree, shrub vegetation	$321-536/acre	#322
Pasture and hay planting	Seedbed preparation, see and seeding, non-native	$125/acre	#512
Rangeland planting	Drill or broadcast, native or non-native	$26-644/acre	#550
Critical area planting	Tackifier, erosion blanket, strawmulch	$248-1,229/acre	#342
Brush management	Biological, mechanical	$47-462/acre	#314
Grazing land mechanical treatment		To be determined	#548
Grade stabilization structure	Grade stabilization structure	$250-10,000/no.	#410
Prescribed burning	Prescribed burning	$70/acre	#338
Stream corridor improvement	Stream crossing	$1000-50,000/no.	#578
Land reclamation	Landslide treatment	Not available	#453
Sediment basin	Sediment basin	$4701/no.	#350
Wetland wildlife habitat management	Low-high intensity	10-50/acre	#644
Stream channel stabilization	Stream channel stabilization	$25/ft	#584

Table 10.3 (cont.): Costs to Grazing of Reasonably Foreseeable Compliance Measures

Reasonable Foreseeable Compliance Measure	NRCS Practice Name	NRCS Practice Cost	NRCS Practice Code
Land and Streambank Stabilization Practices (cont.)			
Wetland restoration	Northern CA, coast, planting only, shaping/grading	$157-1,200/acre	#657
Streambank and shoreline protection	Low-high complexity	$24-122/ft	#580
Riparian forest buffer/herbaceous cover	Riparian forest buffer/herbaceous cover	$203-971/acre	#391A #390
CEQA mitigations			
Mulch	Moisture and erosion control	$299/acre	#484B
Protecting drainage channels from sediment contributions	Channel bank vegetation	$321/acre	#322B

Source: Source: California Approved Fiscal Year 2008 Payment Schedule for Siskiyou County District of the Natural Resources Conservation Service.

10.3.4 Suction Dredging

Staff recommends to the Regional Water Board the limitation of suction dredging in the Klamath River Basin to certain times and locations in order to protect thermal refugia that mitigate water temperatures that are stressful to salmonids. Staff concludes that there are no specific costs to the suction dredging community associated with the TMDL or revised DO objectives. This is because the prohibition proposed for adoption does not prohibit suction dredging throughout the watershed; only in those tributaries in which thermal refugia exists.

10.3.5 Iron Gate Hatchery

The issues associated with the Iron Gate Hatchery are complex due to the location and issues surrounding the hatchery operation. Site-constraints and technical factors make it necessary for an engineering study to be completed before an economic analysis can be completed for the hatchery aspect of the TMDL and revised DO objectives. Some of the potential improvements that might be required in order for the hatchery to meet the TMDL requirements and revised DO objectives under a revised NPDES permit, could include improvements to settling ponds, treatment technologies (such as installation of a package treatment plant), modifications of operations, additional monitoring and laboratory analyses, and a potential off-sets program including up-stream treatment.

PacifiCorp has agreed to provide certain funding to the hatchery including "100% of the hatchery operations and maintenance necessary to fulfill annual mitigation objectives developed by the California Department of Fish and Game in consultation with the National Marine Fisheries Service (AIP 2008)." There may be some overlap in the requirements of these agencies and those of the Regional Water Board under the Klamath TMDL Action Plan. Further, some of these costs to the hatchery associated with water quality protection would be required as part of the upcoming NPDES permit update, regardless of the TMDL.

At present both the reasonably foreseeable compliance measures and their costs are too speculative to include here. Staff concludes that addressing these complex issues and

creating an effective implementation plan is likely to be costly. The Regional Water Board has already begun working with the CDFG to address these difficult issues.

10.3.6 Roads

The road networks in the Klamath Basin contribute to elevated temperatures in tributary watersheds through the discharge of excess sediment. The implementation plan requires parties responsible for managing roads in the Klamath Basin to implement measures that meet the TMDL allocations, TMDL targets, and revised DO objectives. In some cases, an inventory of roads will determine that decommissioning or upgrading of roads is required. Table 10.4 outlines the estimated costs for this type of work. The targets, rationale for the targets, and the specific implementation measures that will be required under the TMDL for private, county, state (Caltrans) and federal (USFS, BLM) maintained roads are discussed in Chapter 6.

Regardless of the method of regulation or the responsible party, the requirements for controlling sources of sediment from roads are similar and implementation will potentially focus on the following process:

1. Inventory: Identify sources of excess sediment discharge or threatened discharge and quantify the discharge or threatened discharge from the source(s).
2. Prioritize: Prioritize efforts to control discharge of excess sediment based on, but not limited to, severity of threat to water quality and beneficial uses, the feasibility of source control, and source site accessibility.
3. Implement: Develop and implement feasible sediment control practices to prevent, minimize, and control the discharge. Road decommissioning may be required as part of a responsible parties' load allocation if maintaining the road is cost prohibitive, road is not needed or is a source of uncontrollable excess sediment discharge.
4. Monitor and Adapt: Use monitoring results to direct adaptive management in order to refine excess sediment control practices and implementation schedules until discharges are reduced to a level that meets the TMDL load allocations and water quality standards.

Table 10.4: Estimated Costs for Reasonably Foreseeable Compliance Measures for Roads

Reasonably Foreseeable Compliance Measure	Best Management Practice	BMP estimated cost	Source of data
Costs for Road and Crossing Construction and Maintenance Activities			
Surface stabilization	Asphalt paving	$238,000/mile	Siskiyou County Public Works
	Chip sealing	$57,000/mile	Siskiyou County Public Works
	Rocking	$4,250-10,000/1000 ft	Weaver, et. al. (2006)
	Dust abatement	$90hr	Harris Blade Rental, Livermore - operated water truck

Table 10.4 (cont.): Estimated Costs for Reasonably Foreseeable Compliance Measures for Roads

Reasonably Foreseeable Compliance Measure	Best Management Practice	BMP estimated cost	Source of data
Costs for Road and Crossing Construction and Maintenance Activities (cont.)			
Fill slope/cutbank compliance measures	Removal/stabilization of unstable fill.	$2-5/cubic yard	Weaver, et. al. (2006)
	Soil stabilization (mulch/vegetate) of fill and cut slopes.	$19-22/1000 ft.	Weaver, et. al. (2006)
Control sediment discharge from insloped or crowned roads	Disconnect road drainage from watercourses (drain to hillslopes).	$170/1000 ft	Weaver, et. al. (2006)
	Install rolling dip	$85-170/ each	Weaver, et. al. (2006)
	Install ditch relief culvert	$645-825/ each	Weaver, et. al. (2006)
	Install stream crossing	$3,270/each	Weaver, et. al. (2006)
CEQA mitigation measures	Conservation cover	$189-509/acre	NRCS#327
	Mulching	$299/acre	NRCS #484
Costs for Stream Crossing Activities			
Stabilize/treat crossing approach	Rock road surface	$4,250-10,000/1000 ft	Weaver, et. al. (2006)
	Water for dust abatement	To be determined	
	Install additional road drainage: waterbars, rolling dips, cross drains	$85-3,270/each	Weaver, et. al. (2006)
Stabilize/treat crossings and associated fills	Remove undersized/failing culverts	$3-10/cubic yard	Weaver, et. al. (2006)
	Remove unstable fill	$2-5/cubic yard	Weaver, et. al. (2006)
	Rock armor, rip rap fill slopes	To be determined	
	Provide “fail safe” road drainage on crossings with diversion potential	To be determined	
	Drain road away from unprotected fills	$10,000-75,000/mile	Weaver, et. al. (2006)
	Bioengineered structures (e.g. willow waddles)	To be determined	
	Mulch, vegetate or rock exposed soil with access to watercourses	To be determined	
Construct storm-proof crossings and associated fills		To be determined	
CEQA mitigation measures	Conservation cover	$189-509/acre	NRCS#327
	Mulching	$299/acre	NRCS #484
	Streambank and shoreline protection	$24-122/ft	NRCS #580
Costs of Road Planning Activities			
Develop a Road System Plan	Erosion Control Plan, non-timber land use	$3528-7,740/100 acres	R. Fitzgerald Memo dated August 6, 2005
	Erosion Control Plan, timber land use	$2,370-7,740/100 acre	
	Road System Plan	To be determined	

Table 10.4 (cont.): Estimated Costs for Reasonably Foreseeable Compliance Measures for Roads

Reasonably Foreseeable Compliance Measure	Best Management Practice	BMP estimated cost	Source of data
Costs of Road Decommissioning			
Road decommissioning	Recontour road to provide for a stable, hydrologically "invisible" site (e.g. remove perched fill, outslope old road prism, remove crossings)	$2,000-$50,000/mile depending on steepness and location of road	Weaver, et. al. (2004)
	Minimize road system (density) to correspond with maintenance resources	$2,000-$50,000/mile to recontour unnecessary roads	Weaver, et. al. (2004)
	Decommission roads adjacent to watercourse and relocate to midslope or ridgetop if possible	To be determined	
CEQA mitigation measures	Conservation cover	$189-509/acre	NRCS#327
	Mulching	$299/acre	NRCS #484
	Streambank and shoreline protection	$24-122/ft	NRCS #580

10.3.7 Timber

Timber harvest activities can substantially impact water temperature. The Klamath implementation plan focuses on controlling sediment and protecting riparian functions from timber harvest activities to meet the watershed-wide TMDL allocations for temperature described earlier in this section. Timber harvest on nonfederal lands is currently regulated by the Regional Board through a combination of general WDRs and conditional waivers of WDRs. The costs associated with WDRs are not outlined here as they are a current requirement. Roads that are part of a timber harvest plan or Non-Industrial Timber Management Plan (NTMP) area require an erosion control plan to be implemented by the WDRs and waivers for timber harvest on nonfederal lands. Table10.5 includes the reasonably foreseeable compliance measures identified in Chapter 9. However, staff judges that there are no additional costs to timber operators associated with TMDL compliance.

Table 10.5: Estimated Costs to Timber Operators of Reasonably Foreseeable Compliance Measures

Reasonably Foreseeable Compliance Measures	Best Management Practice	Estimated cost of BMP	Source of data
Compliance measures on private land	Increased riparian canopy retention in Class I and II watercourses	None	Staff judgment
	Retain in-channel trees following timber operations	None	Staff judgment

Table 10.5 (cont.): Estimated Costs to Timber Operators of Reasonably Foreseeable Compliance Measures

Reasonably Foreseeable Compliance Measures	Best Management Practice	Estimated cost of BMP	Source of data
Compliance measures on private land (cont.)	No timber harvest activities (including tree felling) within the channel zone of a Class III watercourse except for use and maintenance of road and crossings.	None	Staff judgment
	Implement Threatened and Impaired Rules (Forest Practice Rules, 2009, section 916.9, 936.9) watershed-wide in the Klamath River watershed.	No additional cost	Staff judgment

10.3.8 Summary

Sunding and Zwane (2004) produced the Recovery Strategy for California Coho Salmon: Report to the California Fish and Game Commission (Strategy) in which they assessed the costs of implementing the Strategy in each hydrologic unit, including the Klamath River. The main activities associated with implementation of the Strategy are similar to those associated with compliance with the Klamath River TMDL and revised DO objectives, the estimated costs of which are reproduced in Table 10.6. As described above, where costs are incurred as a result of the implementation/enforcement of another program, they can not be attributed to the Klamath River TMDL and revised DO objectives. However, because these costs were estimated for the whole watershed, they are included here for illustration purposes.

Table 10.6: Estimated Costs of Coho Recovery Actions for the Klamath River Basin

Action	Potential Sites (#)	Actual Sites (#)	Estimated Cost ($)	Unit Cost ($/unit)
Barrier removal (dam)	31	16	7,137,216	460,456
Barrier removal (non-structural sites)	752	376	3,635,213	9,668
Barrier removal (stream crossings)	291	146	18,220,276	125,225
Barrier removal (unknown/other barriers)	17	9	94,292	37,367
Barrier removal (water diversions)	78	39	1,344,905	34,485
Riparian revegetation	NA	103 stream miles	18,721,487	180,993
Streambank restoration	NA	20 stream miles	25,893,312	1,316,722
Fencing	NA	1,748 stream miles	12,830	7
Klamath Basin Total			75,059,531	

Monies spent under the Strategy are monies saved under the Klamath River TMDL and revised DO objectives for the following categories of expenditures:

- Non-structural barrier removal to temperature refugia,
- Stream crossing repairs,
- Riparian revegetation,
- Streambank restoration, and
- Fencing.

10.4 Sources of Funding

Potential sources of funding include monies from private and public sources. Public financing includes, but is not limited to: grant funds, as described below; single-purpose appropriations from federal, state, and/or local legislative bodies; and, bond indebtedness and loans from government institutions.

10.4.1 Funding Source Provided through the Agreement In Principle (AIP)

The United States, State of California, State of Oregon, and PacifiCorp signed an Agreement In Principle (AIP) on November 13, 2008 in which certain interim provisions are made with respect to the hydroelectric facilities on the Klamath River prior to final agreement on the decommissioning of the dams. In the AIP, PacifiCorp agreed to provide $500,000 annually to the California Klamath Restoration Fund/Coho Enhancement Fund (Restoration and Enhancement Fund) to be administered jointly by the California Department of Fish and Game (in conjunction with the State Water Resources Control Board) and NOAA Fisheries. The Restoration and Enhancement Fund is intended to fund habitat and fish restoration actions within the Klamath Basin that will benefit coho salmon.

10.4.2 Summary of Pertinent State Funding Programs

There are several potential sources of public financing through grant and funding programs administered, at least in part, by the Regional Water Board and the State Water Board. These programs vary over time depending upon federal and state budgets and ballot propositions approved by voters. State funding pertinent to the proposed Action Plan for the Klamath River are summarized and described below. Additional information can be found on the State Water Resources Control Board webpage (http://www.waterboards.ca.gov/water_issues/programs/grants_loans/).

10.4.2.1 Agricultural Drainage Loan Program

The Agricultural Drainage Loan Program was created by the Water Conservation and Water Quality Bond Act of 1986 to address treatment, storage, conveyance, or disposal of agricultural drainage water that threatens waters of the State. There is a funding cap of $20 million for implementation projects and $100,000 for feasibility studies. Loan repayments are for a period of up to 20 years.

10.4.2.2 Agricultural Drainage Management Loan Program

The Agricultural Drainage Management Loan Program, created by Proposition 204 and distributed through the Agricultural Drainage Management Subaccount, provides loan and grant funding for Drainage Water Management Units. Drainage Water Management

Units are land and facilities for the treatment, storage, conveyance, reduction or disposal of agricultural drainage water that, if discharged untreated, would pollute or threaten to pollute the waters of the State. This program is available to any city, county, district, joint power authority, or other political subdivision of the State involved with water management.

10.4.2.3 Agricultural Water Quality Grants Program

The Agricultural Water Quality Grant Program provides funding for projects that reduce or eliminate non-point source pollution discharge to surface waters from agricultural lands. Funding from Propositions 40 and 50 were administered through two solicitations, most recently the 2005-2006 Consolidated Grants Process. Additional funds will be made available in the future through Proposition 84.

10.4.2.4 Federal Clean Water Act Section 319 Nonpoint Source Implementation Program

This program is an annual federally funded nonpoint source pollution control program that is focused on controlling activities that impair beneficial uses and on limiting pollutant effects caused by those activities. States must establish priority rankings for waters on lists of impaired waters and develop action plans, known as Total Maximum Daily Loads (TMDLs), to improve water quality. Project proposals that address TMDL implementation and those that address problems in impaired waters are favored in the selection process. There is also a focus on implementing management activities that lead to reduction and/or prevention of pollutants that threaten or impair surface and ground waters.

10.4.2.5 Clean Water State Revolving Fund

The Federal Water Pollution Control Act (Clean Water Act or CWA), as amended in 1987, provides for establishment of a Clean Water State Revolving Fund (CWSRF) program. The program is funded by federal grants, State funds, and Revenue Bonds. The purpose of the CWSRF program is to implement the CWA and various State laws by providing financial assistance for the construction of facilities or implementation of measures necessary to address water quality problems and to prevent pollution of the waters of the State.

The CWSRF Loan Program provides low-interest loan funding for construction of publicly-owned wastewater treatment facilities, local sewers, sewer interceptors, water recycling facilities, as well as, expanded use projects such as implementation of nonpoint source (NPS) projects or programs, development and implementation of estuary Comprehensive Conservation and Management Plans, and storm water treatment.

10.4.3 Summary of Pertinent Federal Funding Programs

Several federal agencies, including but not limited to the U.S. Environmental Protection Agency, NOAA Fisheries, U.S. Fish and Wildlife Service, and USDA Natural Resources Conservation Service, also provide grants and other funding opportunities. The U.S. Environmental Protection Agency provides access through its webpage to a catalog of federal funding opportunities: <http://cfpub.epa.gov/fedfund/>. Table 10.7 lists the federal funding programs pertinent to the water quality protection work required in the Klamath River watershed.

Table 10.7: Summary of Pertinent Federal Funding Programs

Funding Program	Program Description	FY2009 Funds
Aquatic Ecosystem Restoration (CAP Section 206)	Work under this authority may carry out aquatic ecosystem restoration projects that will improve the quality of the environment, are in the public interest, and are cost-effective. There is no requirement that an existing Corps project be involved	$28.7 million
Bring Back the Natives Grant Program	The Bring Back the Natives initiative (BBN) funds on-the-ground efforts to restore native aquatic species to their historic range. Projects should involve partnerships between communities, agencies, private landowners, and organizations that seek to rehabilitate streamside and watershed habitats. Projects should focus on habitat needs of species such as fish, invertebrates, and amphibians that originally inhabited the waterways across the country. Funding for the BBN program is administered through NFWF from federal agencies cooperating to support this program. Cooperating agencies and organizations include the US Fish and Wildlife Service (FWS), Bureau of Land Management (BLM), USDA Forest Service (FS), and Trout Unlimited (TU).	TBD
Coastal Program	The U.S. Fish and Wildlife Service (FWS) Coastal Program works to conserve healthy coastal habitats on public or private land for the benefit of fish, wildlife, and people in 22 specific coastal areas. The program forms cooperative partnerships designed to (1) protect costal habitats by providing technical assistance for conservation easements and acquisitions; (2) restore coastal wetlands, uplands, and riparian areas; and (3) remove barriers to fish passage in coastal watersheds and estuaries. Program biologists provide restoration expertise and financial assistance to federal and state agencies, local and tribal governments, businesses, private landowners, and conservation organizations such as local land trusts and watershed councils.	$14.74 million
Community-based Habitat Restoration Partnership Grants	The NOAA Community-based Restoration Program (CRP) provides funds for small-scale, locally driven habitat restoration projects that foster natural resource stewardship within communities. The program seeks to bring together diverse partners to implement habitat restoration projects to benefit living marine resources. Projects might include restoring salt marshes, mangroves, and other coastal habitats; improving fish passage and habitat quality for anadromous species; removing dams; restoring and creating oyster reefs, removing exotic vegetation and replanting with native species; and similar projects to restore habitat or improve habitat quality for populations of marine and anadromous fish.	$6.3 million
Conservation Reserve Program	The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners. Through CRP, you can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland.	$1.9 billion

Table 10.7 (cont.): Summary of Pertinent Federal Funding Programs

Funding Program	Program Description	FY2009 Funds
Conservation Security Program	The Conservation Security Program (CSP) is a voluntary conservation program that supports ongoing stewardship of private lands by providing payment for maintaining and enhancing natural resources. CSP identifies and rewards those farmers and ranchers who are meeting the highest standards of conservation and environmental management on their operations.	$283 million
Emergency Watershed Protection	The USDA Natural Resources Conservation Service's Emergency Watershed Protection (EWP) program helps protect lives and property threatened by natural disasters such as floods, hurricanes, tornadoes, droughts, and wildfires. EWP provides funding for such work as clearing debris from clogged waterways, restoring vegetation, and stabilizing river banks. The measures that are taken must be environmentally and economically sound and generally benefit more than one property owner. EWP also provides funds to purchase floodplain easements as an emergency measure. Floodplain easements restore, protect, maintain, and enhance the functions of the floodplain; conserve natural values including fish and wildlife habitat, water quality, flood water retention, ground water recharge, and open space; reduce long-term federal disaster assistance; and safeguard lives and property from floods, drought, and the products of erosion. EWP can provide up to 90 percent cost share in limited resource areas as determined by the US Census.	TBD (Total funding depends on the amount of emergency funds requested during the fiscal year)
Environmental Quality Incentives Program	The USDA Natural Resources Conservation Service's Environmental Quality Incentives Program (EQIP) was established to provide a voluntary conservation program for farmers and ranchers to address significant natural resource needs and objectives. EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide financial assistance to program participants to implement conservation practices. Persons or legal entities, who are owners of land under agricultural production or who are engaged in livestock or agricultural production on eligible land may participate in EQIP. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. NRCS approves the plan of operations and obligates contract funds for the conservation practices listed in the plan of operations.	$1.067 billion

Table 10.7 (cont.): Summary of Pertinent Federal Funding Programs

Funding Program	Program Description	FY2009 Funds
Farm and Ranch Lands Protection Program (FRPP)	The USDA Natural Resources Conservation Service's Farmland Protection Program (FPP) is a voluntary program that helps farmers and ranchers keep their land in agriculture and prevents conversion of agricultural land to non-agricultural uses. The program provides matching funds to organizations with existing farmland protection programs that enable them to purchase conservation easements. These entities purchase easements from landowners in exchange for a lump sum payment, not to exceed the appraised fair market value of the land's development rights. The easements are for perpetuity unless prohibited by state law. Eligible land is land on a farm or ranch that has prime, unique, statewide, or locally important soil or contains historical or archaeological resources; supports the policy of a State or local farm and ranch land protection policy; is subject to a pending offer by an eligible entity; and includes cropland, rangeland, grassland, pasture land, forest land and other incidental land that is part of an agricultural operation.	$105 million (for technical and financial assistance)
Five-Star Restoration Program	The EPA supports the Five-Star Restoration Program by providing funds to the National Fish and Wildlife Foundation and its partners, the National Association of Counties, NOAA's Community-based Restoration Program and the Wildlife Habitat Council. These groups then make subgrants to support community-based wetland and riparian restoration projects. Competitive projects will have a strong on-the-ground habitat restoration component that provides long-term ecological, educational, and/or socioeconomic benefits to the people and their community. Preference will be given to projects that are part of a larger watershed or community stewardship effort and include a description of long-term management activities. Projects must involve contributions from multiple and diverse partners, including citizen volunteer organizations, corporations, private landowners, local conservation organizations, youth groups, charitable foundations, and other federal, state, and tribal agencies and local governments. Each project would ideally involve at least five partners who are expected to contribute funding, land, technical assistance, workforce support, or other in-kind services that are equivalent to the federal contribution.	$300,000
Healthy Forests Reserve Program	The Healthy Forests Reserve Program (HFRP) is a voluntary program established for the purpose of restoring and enhancing forest ecosystems to: 1) promote the recovery of threatened and endangered species, 2) improve biodiversity; and, 3) enhance carbon sequestration. Program implementation has been delegated by the Secretary of Agriculture to the Natural Resources Conservation Service.	TBD

Table 10.7 (cont.): Summary of Pertinent Federal Funding Programs

Funding Program	Program Description	FY2009 Funds
Forest Legacy Program	Through its Forest Legacy Program (FLP), the USDA Forest Service supports state efforts to protect environmentally sensitive forest lands from the conversion to non-forest uses through the use of conservation easements and fee-simple purchase. Designed to encourage the protection of privately owned forest lands, FLP is an entirely voluntary program. The program enables landowners to retain ownership of their land and continue to earn income from it while keeping drinking water safe and clean, conserving valuable open space as well as protecting critical wildlife habitats and outdoor recreation opportunities. The program promotes professional forest management and requires forest management plans. The program emphasizes strategic conservation - working in partnership with States, local communities and non-governmental organizations to make a difference on the land and for communities by conserving areas of unbroken forest, watershed or river corridor forests or by complimenting existing land conservation efforts. FLP conservation easements restrict development, protect a range of public values and many require public access for recreation.	$57 million
NOAA Open Rivers Initiative	The NOAA Open Rivers Initiative (ORI) provides funding and technical expertise for community-driven, small dam and river barrier removals, primarily in coastal states. Projects are expected to provide an economic boost for communities, enhance public safety, and improve populations of NOAA trust resources such as striped bass, Atlantic and shortnose sturgeon, Atlantic and Pacific salmon, American eel, American shad, blueback herring, and alewife. Proposals selected will be implemented through a cooperative agreement	$7 million
National Integrated Water Quality Program (NIWQP)	The National Integrated Water Quality Program (NIWQP) provides funding for research, education, and extension projects aimed at improving water quality in agricultural and rural watersheds. The NIWQP has identified eight "themes" that are being promoted in research, education and extension. The eight themes are (1) Animal manure and waste management (2) Drinking water and human health (3) Environmental restoration (4) Nutrient and pesticide management (5) Pollution assessment and prevention (6) Watershed management (7) Water conservation and agricultural water management (8) Water policy and economics. Awards are made in four program areas - National Facilitation Projects, Regional Coordination Projects, Extension Education Projects, and Integrated Research, Education and Extension Projects. Please note that funding is only available to universities.	$12 million

Table 10.7 (cont.): Summary of Pertinent Federal Funding Programs

Funding Program	Program Description	FY2009 Funds
National Wildlife Refuge Friends Group Grant Program	The National Fish and Wildlife Foundation provides grants for projects that help organizations to be effective co-stewards of our Nation's important natural resources within the National Wildlife Refuge System. This program provides competitive seed grants to help increase the number and effectiveness of organizations interested in assisting the refuge system nationwide. The program will fund: (1) Start-up Grants to assist starting refuge support groups with formative and/or initial operational support (membership drives, training, postage, etc.); (2) Capacity Building Grants to strengthen existing refuge support groups' capacity to be more effective (outreach efforts, strategic planning, membership development); and (3) Project Specific Grants to support a specific project (conservation education programs for local schools, outreach programs for private landowners, habitat restoration projects, etc.)	TBD
Native Plant Conservation Initiative	The National Fish and Wildlife Foundation's Native Plant Conservation Initiative (NPCI) supports on-the-ground conservation projects that protect, enhance, and/or restore native plant communities on public and private land. Projects typically fall into one of three categories and may contain elements of each: protection and restoration, information and education, and inventory and assessment. Applicants are encouraged, when appropriate, to include a pollinator component in their project. This program is funded by the Bureau of Land Management, Forest Service, Fish and Wildlife Service, and National Park Service.	TBD
North American Wetlands Conservation Act Grants Program	The U.S. Fish and Wildlife Service's Division of Bird Habitat Conservation administers this matching grants program to carry out wetlands and associated uplands conservation projects in the United States, Canada, and Mexico. Grant requests must be matched by a partnership with nonfederal funds at a minimum 1:1 ratio. Conservation activities supported by the Act in the United States and Canada include habitat protection, restoration, and enhancement. Mexican partnerships may also develop training, educational, and management programs and conduct sustainable-use studies. Project proposals must meet certain biological criteria established under the Act. Visit the program web site for more information. (Click on the hyperlinked program name to see the listing for "Primary Internet".)	$83 million
Partners for Fish and Wildlife Program	The Partners for Fish and Wildlife Program provides technical and financial assistance to private landowners to restore fish and wildlife habitats on their lands. Since 1987, the program has partnered with more than 37,700 landowners to restore 765,400 acres of wetlands; over 1.9 million acres of grasslands and other upland habitats; and 6,560 miles of in-stream and streamside habitat. In addition, the program has reopened stream habitat for fish and other aquatic species by removing barriers to passage.	TBD

Table 10.7 (cont.): Summary of Pertinent Federal Funding Programs

Funding Program	Program Description	FY2009 Funds
Pesticide Environmental Stewardship Grants	EPA's Pesticide Environmental Stewardship Program (PESP) offers grants to support the reduction of risks from pesticides in agricultural and non-agricultural settings, and to implement pollution prevention measures. All organizations with a commitment to pesticide risk reduction are eligible to join PESP as members, either as Partners or as Supporters. For more information about membership requirements and available grants, click on the program name and refer to the link listed under "Primary Internet."	$500,000
Project Modifications for Improvement of the Environment (CAP Section 1135)	Work under this authority provides for modifications in the structures and operations of water resources projects constructed by the Corps of Engineers to improve the quality of the environment. Additionally, the Corps may undertake restoration projects at locations where an existing Corps project has contributed to the degradation. The primary goal of these projects is ecosystem restoration with an emphasis on projects benefiting fish and wildlife. The project must be consistent with the authorized purposes of the project being modified, environmentally acceptable, and complete within itself	$28.7 million
Pulling Together Initiative	The National Fish and Wildlife Foundation's Pulling Together Initiative (PTI) provides a means for federal agencies to partner with state and local agencies, private landowners, and other interested parties to develop long-term weed management projects within the scope of an integrated pest management strategy. The goals of PTI are: (1) to prevent, manage, or eradicate invasive and noxious plants through a coordinated program of public/private partnerships; and (2) to increase public awareness of the adverse impacts of invasive and noxious plants. PTI provides support on a competitive basis for the formation of local weed management area (WMA) partnerships, allowing them to demonstrate successful collaborative efforts and develop permanent funding sources for the maintenance of WMAs from the involved parties. Successful projects will serve to increase public awareness and interest in future partnership projects.	TBD
Watershed Protection and Flood Prevention Program	Also known as the 'Watershed Program' or the 'PL 566 Program,' this program provides technical and financial assistance to address water resource and related economic problems on a watershed basis. Projects related to watershed protection, flood mitigation, water supply, water quality, erosion and sediment control, wetland creation and restoration, fish and wildlife habitat enhancement, agricultural water conservation, and public recreation are eligible for assistance. Technical and financial assistance is also available for planning new watershed surveys.	$40 million

Table 10.7 (cont.): Summary of Pertinent Federal Funding Programs

Funding Program	Program Description	FY2009 Funds
Sustainable Agriculture Research and Education	The Sustainable Agriculture Research and Education (SARE) program of the U.S. Department of Agriculture works to advance farming systems that are more profitable, environmentally sound and good for communities through an innovative grants program. More specifically, SARE funds scientific investigation and education to reduce the use of chemical pesticides, fertilizers, and toxic materials in agricultural production; to improve management of on-farm resources to enhance productivity, profitability, and competitiveness; to promote crop, livestock, and enterprise diversification and to facilitate the research of agricultural production systems in areas that possess various soil, climatic, and physical characteristics; to study farms that have are managed using farm practices that optimize on-farm resources and conservation practices; and to promote partnerships among farmers, nonprofit organizations, agribusiness, and public and private research and extension institutions. Click on program name and check the link in the Primary Internet box for more information about grant opportunities and program results.	$14.4 million
Watershed Rehabilitation Program	This program provides Federal cost-share funding for the rehabilitation of aging dams that were installed primarily through the Watershed Protection and Flood Prevention Program over the past 55 years. The purpose for rehabilitation is to extend the service life of dams and bring them into compliance with applicable safety and performance standards or to decommission the dams so they no longer pose a threat to life and property.	$40 million through the FY2009 Appropriations, $50 million through the American Recovery and Reinvestment Act
Watershed Rehabilitation Program	This program provides Federal cost-share funding for the rehabilitation of aging dams that were installed primarily through the Watershed Protection and Flood Prevention Program over the past 55 years. The purpose for rehabilitation is to extend the service life of dams and bring them into compliance with applicable safety and performance standards or to decommission the dams so they no longer pose a threat to life and property.	$40 million through the FY2009 Appropriations, $50 million through the American Recovery and Reinvestment Act
Wetlands Reserve Program	Through this voluntary program, the USDA Natural Resources Conservation Service (NRCS) provides landowners with financial incentives to restore and protect wetlands in exchange for retiring marginal agricultural land. To participate in the program landowners may sell a conservation easement or enter into a cost-share restoration agreement (landowners voluntarily limit future use of the land, but retain private ownership). Landowners and the NRCS jointly develop a plan for the restoration and maintenance of the wetland.	$500 million

Table 10.7 (cont.): Summary of Pertinent Federal Funding Programs

Funding Program	Program Description	FY2009 Funds
Wildlife Habitat Incentives Program	The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat on private lands. It provides both technical assistance and cost sharing to help establish and improve fish and wildlife habitat. Participants work with USDA's Natural Resources Conservation Service to prepare a wildlife habitat development plan in consultation with a local conservation district. The plan describes the landowner's goals for improving wildlife habitat, includes a list of practices and a schedule for installing them, and details the steps necessary to maintain the habitat for the life of the agreement.	$74 million

CHAPTER 10. REFERENCES

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